

VII.—*On Eupetaurus, a new form of Flying Squirrel from Kashmir.*By OLDFIELD THOMAS, *British Museum (Natural History).*

[Received August 8th ;—Read Sept. 5th, 1888.]

(With Plates XXII and XXIII.)

As long ago as 1877, Mr. W. T. Blanford received, among a set of mammals obtained by Mr. L. Mandelli, the skin of a large flying squirrel belonging evidently to a new form, but in such a bad condition that no scientific description of it could be given, and the skin has therefore remained unnamed until the present time. Precisely the same thing has happened in the case of a skin obviously of the same animal purchased by Mr. R. Lydekker about 1879 from some skin-dealers in Srinagar, Kashmir, and said to be from the Astor district. Both these specimens have now been presented by their respective owners to the national collection. Mr. Lydekker's specimen is a most magnificent example, so far as its size and the character of its fur are concerned, but again, being without a skull, and showing a certain superficial resemblance to what the common Indian Flying squirrel, *Pteromys oral*, Tickell, might be if occurring in a cold climate, no zoologist has dared to describe it.

Finally, before speaking of the specimen that has settled what this fine squirrel really is, a reference may be made to two flying squirrels in the Leyden Museum described by Dr. Anderson*, one said to be from Kashmir and the other probably from Thibet, which, judging only from his descriptions, may be not improbably a melanoid and a normal, but imperfect, example respectively of this most interesting addition to the known fauna of India.

At last in 1887, Mr. G. M. Giles, of the Indian Marine Survey, when on the Kafirstán-Chitral Mission under Colonel Lockhart, C. B., had brought to him at Gilgit a living example of the present form, which had been taken at an altitude of about 6000 feet. This specimen on its death was skinned, and, fortunately, its skull brought home for comparison, and by the kindness of Prof. Wood-Mason and Mr. Giles I have been entrusted with it for description.

It is by the skull alone, first brought home by Mr. Giles, that we are enabled to make out its true position, as no one, from an inspection of the skin, would have suspected that the animal was anything but a fine and very long-furred species of *Pteromys*. The skull, however, shows that this is not the case, and that the species must be relegated to a new genus, representing a highly specialized hypsodont form quite unapproached, so far as its dental characters are concerned, by any member of the family *Sciuridæ*.

* Zool. Yunn. Exp. Mamm. pp. 284 and 286, 1878.

Of the three specimens before me I propose to call the two received from Mr. Lydekker and Mr. Giles together the co-types, the description of the external characters and the coloured plate being founded on the former, as the largest and finest specimen of all, while the latter has furnished the particulars for the description and figures of the skull and teeth.

EUPETAURUS, gen. nov.

Externally as in *Pteromys*, except that the claws do not possess the exceeding sharpness characteristic of all previously known floating mammals.*

Skull distinguished from that of *Pteromys* by its longer, trumpet-shaped muzzle, more marked supraorbital notches, longer anterior palatine foramina, and shorter bony palate.

Teeth strikingly contrasted with those of any of the other *Sciuridæ* by being hypsodont instead of brachyodont, while their essential pattern remains unchanged. Thus, while the crown of each tooth is enormously lengthened vertically, the grooves ordinarily present on the grinding surface of the molars of *Pteromys* are reproduced as deep vertical infoldings of the enamel, which, when seen in the natural section produced by wear, give the teeth very much the general appearance of those of many of the *Hystricomorpha*. Owing to the worn state of the teeth in the single skull available, it is impossible to say how many extra superficial grooves there may have been, but of the deeper notches there are two on the outer and one on the inner side of each cheek-tooth† above, and two on each side of each tooth below, the anterior internal notch, however, in the posterior teeth almost worn out of sight. The teeth also, apart from their hypsodont structure, are distinguishable by their very large proportional size, by being set more obliquely than is the case in other squirrels, and by presenting, in cross-section, a sharp postero-internal angle, markedly different from the evenly convex internal border of the teeth of *Pteromys*. The implantation of the large upper premolar is also peculiar, in that of the three distinct roots it has in the allied forms the antero-external and the internal have coalesced into a single broad flat root running along the whole of the long antero-internal border of the tooth.

* Whether Flying Phalangers, Flying Squirrels, or Galeopithecii, this sharpness of the claws is obviously an adaptive character of the highest utility to an animal in the habit of taking long flying leaps from tree to tree and yet without the Bat's or Bird's power of saving itself from a more or less serious fall in case it fails to secure its hold on the tree towards which it is leaping.

† Excepting of course the small cylindrical penultimate premolar.

EUPETAURUS CINEREUS,* n. sp. (Plate XXII).

Size equalling or exceeding that of the largest species of *Pteromys*. Fur extremely long, soft, and silky. General colour uniform grizzled greyish brown, the hairs of the back slaty grey for about an inch or an inch and a half, then the tips of the shorter woolly hairs are a dull pale grey, while those of the longer straighter hairs are ornamented with a white subterminal, and a black terminal band. Ears pointed, hairy, their backs black or brown, their internal surfaces grey. Upper surface of parachute darker brown. Hands and feet brown or black; palms and soles thickly hairy, except on the surface of the pads; the former with three distal pads at the bases of the fingers and two large proximal pads, the latter with four distal pads, and a single internal, proximal pad. Whole of under surface pale brownish grey, the hairs slate-coloured basally and dirty white terminally. Tail long, cylindrical, exceedingly bushy, more like that of a fox than that of a squirrel, the hairs averaging nearly 3 inches in length; its colour similar to that of the body, but rather darker terminally. In Mr. Lydekker's specimen there is a small tuft of white hairs at the extreme tip.

Skull as described above, and as shown in detail in the figures (Pl. XXIII). Special attention may, however, be drawn to its comparatively light and slender build, to the long muzzle, the slender frontal processes of the premaxillæ, the deeply concave forehead, long palatine foramina, large expanded bullæ, and to the very peculiar shape of the lower jaw, in which the coronoid process does not rise so high as the condyle, while the latter is bent up away from the angle to an unusually great extent. The incisors are yellow in front, but little darker above than below.

Dimensions:—

	Mr. Lydekker's specimen.	Mr. Giles's specimen.
Head and body ...	610 mm. (= 24 in.)	515 mm.
Tail ...	380 "	480 "
Hind-foot ... (c.)	87 "	85 "
Ear ...	28 "	29 "

Skull. Basal length, (c) 68 millim.; greatest breadth, 46; nasals, length, 28; greatest breadth 14·5, least breadth 6·5; interorbital breadth 20; intertemporal breadth 15·5; post-orbital processes, tip to tip, 34;

* I had originally wished to connect with this animal the name of Mr. Giles, to whose care in bringing a skull as well as a skin we owe the possibility of appreciating its natural position, and to whom therefore mammalogists have every reason to be grateful. Since, however, further investigations have shewn that he was not the original discoverer of the species, an honour that Mr. Mandelli or Mr. Lydekker might equally claim, I consider it better to give it a name altogether impersonal in its nature.

palate, length 41, breadth including posterior premolars 20·8, least breadth inside the same teeth 6·7; diastema, length, 16·8; anterior palatine foramen (c) 8·5; length of molar series, from front of last premolar to back of last molar, 19·3. Lower jaw, length (bone only) 54·5, (to incisor tip) 59, height, from condyle to below angle, 34·6.

The discovery of such a fine new mammal as the present in so comparatively well-known a region as Kashmir, is very remarkable, and especially as *Eupetaurus* is found in Gilgit, a place whose fauna Dr. John Scully, both as collector and describer,* has so thoroughly and ably investigated.

It was under the skilled supervision of Prof. Wood-Mason that Behari Lal Das executed the beautiful drawing of its skull now reproduced to form Plate XXIII.

A further interest, however, attaches to *Eupetaurus* from its being the only member of the *Sciuridæ* in which the character of hypsodontism† has been developed, although, among the whole group of *Sciuro-morpha*, *Castor* and *Anomalurus* have hypsodont teeth, while *Haplodon* has the still further advance of possessing permanently rootless molars. Throughout mammals hypsodontism has been developed independently over and over again, as for example in *Elephas* as compared to the brachyodont *Mastodon*; in *Equus* as compared to *Anchitherium*, in *Neotoma* as compared to *Cricetus*, and, best known of all, in the *Bovidæ* as compared to the *Cervidæ*.

The superiority of high-crowned over low-crowned teeth is obvious, especially to animals living on food that has a strong grinding action on the teeth due either to natural silex contained in it, or to sand and dirt mixed with it. In all cases it is probable that the jaws have a more or less horizontal chewing action in hypsodont, as compared to a vertical "chumping" action in brachyodont animals.

Finally it should be noticed that hypsodontism represents of course only the first step towards the development of entirely rootless teeth, a development that has again often independently taken place, but which must in every case have been by way of hypsodontism, the complete series of steps being evidently as follows. First and least specialized then is the short-crowned long-rooted tooth (as in ordinary brachyodont animals); secondly, the high-crowned short-rooted tooth (as in the hypso-

* Cf. "On the Mammals of Gilgit, p. 35, 1881, p. 197, and "On some Mammals from the North-West frontier of Kashmir," Ann. Mag. N. H. (5) VIII, p. 95, 1881. I understand that Dr. Scully himself recognised Mr. Giles's Flying Squirrel as new.

† A concise description of hypsodontism has been given by Flower, Encycl. Brit. (9) Art. *Mammalia*, XV, p. 471, 1883.

dont forms) ; thirdly, the tooth so high-crowned that its roots are only formed at a late period of life as in *Evotomys* and others; and finally the highly specialized growing tooth that never develops roots at all.

In connection with the dental evolution of this interesting animal, it would be advisable for naturalists and sportsmen in Kashmir to notice what its food is, as compared with that of the other squirrels. Judged from its blunt claws, it probably frequents rocks and precipices rather than trees, and it is therefore possible that its ordinary food may consist of lichens, mosses, and other rock-loving plants, which, by being mixed with sand and particles of rock, would necessitate the development of such long lasting molars as it is remarkable for possessing.

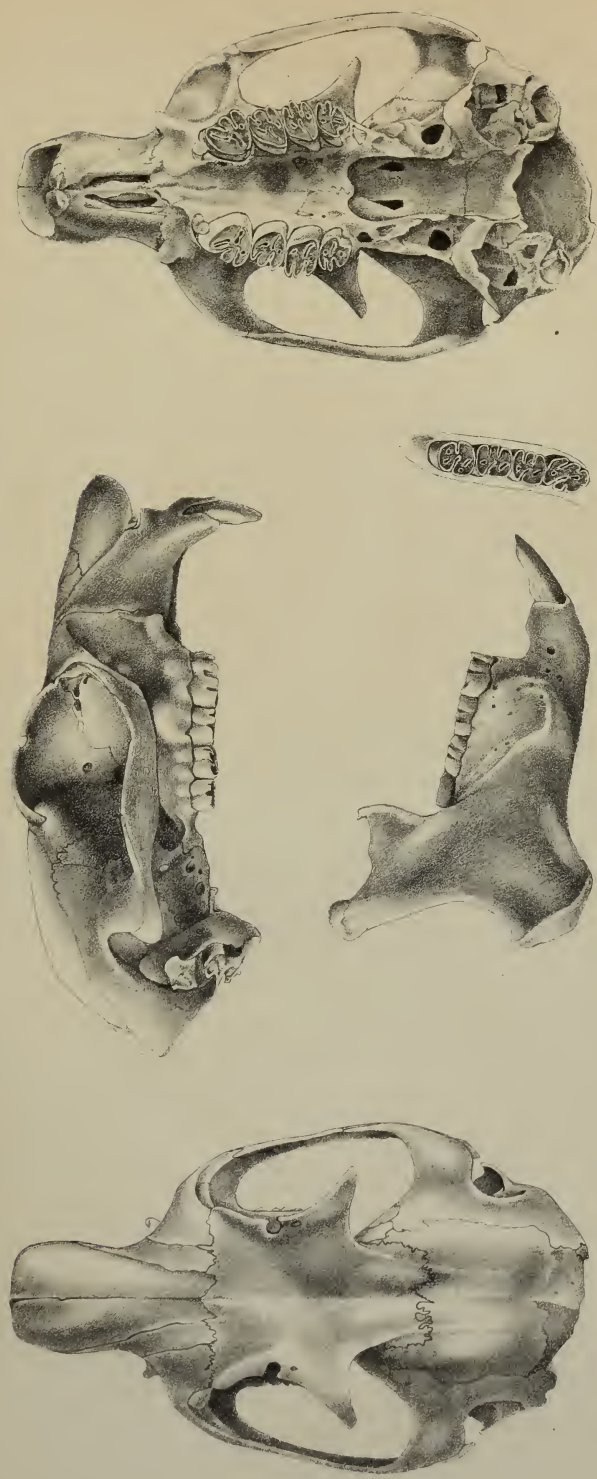
Additional specimens of *Eupetaurus* would be most valuable for scientific examination, especially if of different ages, and I may be permitted to express the hope that some of the many British sportsmen who annually visit Kashmir will help to enrich either the Indian Museum in Calcutta or the National Museum at home with examples of this, the latest addition to the Mammal-fauna of our Indian Empire.

IX.—*Notes on Indian Chiroptera.*—By W. T. BLANFORD, F. R. S.

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In the course of last year, whilst preparing an account of the bats of India and its dependencies for a general work on Indian Mammalia, I found that, in a few instances, scraps of information are now available, in addition to the mass of facts brought together by my friend Mr. G. E. Dobson in his standard works on the order Chiroptera. In a very few cases I am obliged to differ from his nomenclature, the most important of these being the use of the generic term *Hipposiderus* instead of *Phyllorhina*, and of *Xantharpyia* instead of *Cynonycteris*. The reasons for these changes I have explained at length in a paper published in the Proceedings of the Zoological Society for 1887, pp. 636, 637. Some points that I had noted have, I find, been already fully investigated by my friend Mr. J. Scully in his paper on the Chiroptera of Nepal, published in the Society's Journal for last year (Pt. II, p. 233). As some time may still elapse before my work on Mammals will be published, a short note may be useful. I have endeavoured to identify all the species noticed by Hodgson, Blyth, Kelaart, and Jerdon, a few of which, owing doubtless to the difficulty and occasionally impossibility of determining them satisfactorily, have been left unnoticed by Dobson, and,





Behari Lal Das, del.

Eupetaurus cinereus.

Mintern. Proc. 1887.